

Appl. No. 10/500,789

Response to Office Action mailed December 24, 2008

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

**Claims 1 to 35 (canceled)**

**Claim 36. (previously presented)** A method for continuous casting of steel comprising supplying molten steel into a mold using an immersion nozzle, characterized in that at least a part disposed at an internal portion of the immersion nozzle which is brought into contact with the molten steel is formed of a refractory having a desulfurizing ability, wherein the refractory comprises 15 to 40 mass % of C.

**Claim 37. (original)** The method according to claim 36, wherein the molten steel is poured into the mold without feeding an Ar gas to the molten steel flowing through a molten-steel introducing port of the immersion nozzle.

**Claim 38. (original)** The method according to Claim 36, wherein, when the molten steel is an Al-killed steel containing no Ca, continuous casting is performed by feeding an Ar gas into the immersion nozzle at a flow rate of 3 NL/min or less (including 0).

**Claim 39. (canceled)**

**Claim 40. (currently amended)** ~~[[The]]~~ A method according to claim 39 for continuous casting of steel comprising supplying molten steel into a mold using an immersion nozzle for continuous casting,

characterized in that a gas having a desulfurizing ability is supplied into a sidewall portion of the immersion nozzle so as to be injected into a molten-steel introducing port thereof from an inner wall surface or the immersion nozzle,

whereby part of the molten steel flowing through the molten-steel introducing port is desulfurized, said part of the molten steel being present at an inner wall surface portion of the immersion nozzle,

wherein the gas having a desulfurizing ability is at least one gas selected from the group consisting of Mg gas, Ca gas, Mn gas[[,]] and Ce gas.

**Claim 41. (previously presented)** A method for continuous casting of steel, comprising supplying molten steel into a mold using an immersion nozzle for continuous casting,

characterized in that at least one gas of Mg gas, Ca gas, Mn gas, and Ce gas is supplied into a sidewall portion of the immersion nozzle so as to be injected into a molten-steel introducing port thereof from an inner wall surface of the immersion nozzle, and the gas is supplied to the molten steel flowing through the molten-steel introducing port.

**Claims 42 to 46. (canceled)**

**Claim 47. (previously presented)** A method for continuous casting of steel, comprising supplying molten steel into a mold using an immersion nozzle, characterized in that at least a part disposed at an internal portion of the immersion nozzle which is

brought into contact with the molten steel is formed of a refractory which comprises a refractory material including 15 to 40 mass % of C, an oxide and a component to reduce the oxide, the oxide containing an alkaline earth metal.

**Claim 48. (previously presented)** The method according to claim 47, characterized in that the oxide containing an alkaline earth metal primarily comprises MgO, and the component reducing the oxide is at least one metal selected from the group consisting of Al, Ti, Zr, Ce and Ca.

**Claim 49. (previously presented)** The method according to claim 48, characterized in that the content of the MgO in the refractory is 5 to 75 mass percent, and the content of said at least one metal selected from the group consisting of Al, Ti, Zr, Ce and Ca is 15 mass percent or less.

**Claim 50. (canceled)**

**Claim 51. (canceled)**

**Claim 52. (previously presented)** The method according to claim 48, characterized in that the oxide containing an alkaline earth element contains CaO.

**Claim 53. (previously presented)** The method according to claim 52, characterized in that the content of the CaO in the refractory is 5 mass percent or less.

**Claim 54. (previously presented)** A method for continuous casting of steel comprising supplying molten steel into a mold using an immersion nozzle, characterized in that at least a part disposed at an internal portion of the immersion nozzle which is brought into contact with the molten steel is formed of a refractory which comprises a refractory material including 15 to 40 mass % of C, MgO and an Al metal.

**Claim 55. (previously presented)** The method according to claim 54, characterized in that the content of the MgO in the refractory is 5 to 75 mass percent, and the content of the Al metal is 1 to 15 mass percent.

**Claim 56. (previously presented)** The method according to claim 55, characterized in that the content of the Al metal in the refractory is 2 to 15 mass percent.

**Claim 57. (previously presented)** The method according to claim 56, characterized in that the content of the Al metal in the refractory is 5 to 10 mass percent.

**Claim 58. (canceled)**

**Claim 59. (canceled)**

**Claim 60. (previously presented)** The method according to claim 54, characterized in that the refractory material further includes CaO.

**Claim 61. (previously presented)** The method according to claim 60, characterized in that the content of the CaO in the refractory is 5 mass percent or less.

**Claim 62. (previously presented)** The method according to any one of claims 47, 48 and 54, characterized in that the refractory material further includes at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$  and  $\text{TiO}_2$ .

**Claim 63. (previously presented)** The method according to claim 52, characterized in that the refractory material further includes at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$  and  $\text{TiO}_2$ .

**Claim 64. (previously presented)** A method for continuous casting of steel comprising supplying molten steel into a mold using an immersion nozzle, characterized in that at least a part disposed at an internal portion of the immersion nozzle which is brought into contact with the molten steel is formed of a refractory which comprises a refractory material including 15 to 40 mass % of C, spinel ( $\text{MgO} \cdot \text{Al}_2\text{O}_3$ ) and at least one metal selected from the group consisting of Al, Ti, Zr, Ce and Ca.

**Claim 65. (previously presented)** The method according to claim 64, characterized in that the content of the spinel ( $\text{MgO} \bullet \text{Al}_2\text{O}_3$ ) in the refractory is 20 to 99 mass percent, and the content of said at least one metal selected from the group consisting of Al, Ti, Zr, Ce and Ca is 15 mass percent or less.

**Claim 66. (canceled)**

**Claim 67. (canceled)**

**Claim 68. (previously presented)** The method according to claim 64, characterized in that the refractory material further includes CaO.

**Claim 69. (previously presented)** The method according to claim 68, characterized in that the content of the CaO in the refractory is 5 mass percent or less.

**Claim 70. (previously presented)** The method according to claim 64, characterized in that the refractory material further includes at least one compound selected from the group consisting of MgO,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$  and  $\text{TiO}_2$ .



**Claim 71. (previously presented)** The method according to any one of claims 47, 48, 54 and 64, characterized in that the refractory material further includes at least one compound selected from the group consisting of  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$  and  $\text{TiO}_2$ , and the refractory is disposed at an internal portion of the nozzle which is brought into contact with the molten steel.

**Claim 72. (previously presented)** The method according to any one of claims 47, 48, 54 and 64, characterized in that the refractory material further includes at least one compound selected from the group consisting of  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$  and  $\text{TiO}_2$ , and the refractory has a desulfurizing ability.

**Claim 73. (previously presented)** A method according to any one of claims 47, 48, 54 and 64, wherein the refractory material further includes at least one compound selected from the group consisting of  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$  and  $\text{TiO}_2$ , and wherein the immersion nozzle further comprises a supporting refractory which supports said refractory.

**Claim 74. (previously presented)** A method for continuous casting of steel comprising supplying molten steel into a mold using an immersion nozzle, characterized in that a molten-steel introducing port is formed to inject a gas having a desulfurizing ability from inside of a sidewall portion and via an inner wall surface thereof, part of the molten steel flowing through the molten-steel introducing port is desulfurized by the injected gas having a desulfurizing ability, said part of the molten steel being present at the inner wall surface portion.

**Claim 75. (previously presented)** The method according to claim 74, characterized in that the gas having a desulfurizing ability is at least one gas selected from the gas consisting of Mg gas, Ca gas, Mn gas and Ce gas.

**Claim 76. (previously presented)** A method for continuous casting of steel comprising supplying molten steel into a mold using an immersion nozzle, characterized in that a molten-steel introducing port is formed to inject at least one gas selected from the gas consisting of Mg gas, Ca gas, Mn gas and Ce gas from

inside of a sidewall portion and via an inner wall surface of the molten steel introducing port, wherein said at least one gas is injected to the molten steel flowing through the molten steel introducing port.

**Claims 77 to 80. (canceled)**